Great Blue Herons breeding in the Maritime Provinces

Allan D. Smith, Anthony J. Erskine, John W. Chardine, and Julie Paquet

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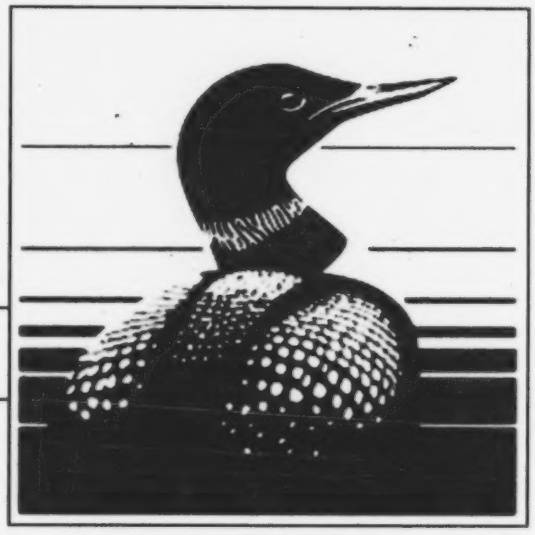

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GREAT BLUE HERONS BREEDING IN THE MARITIME PROVINCES

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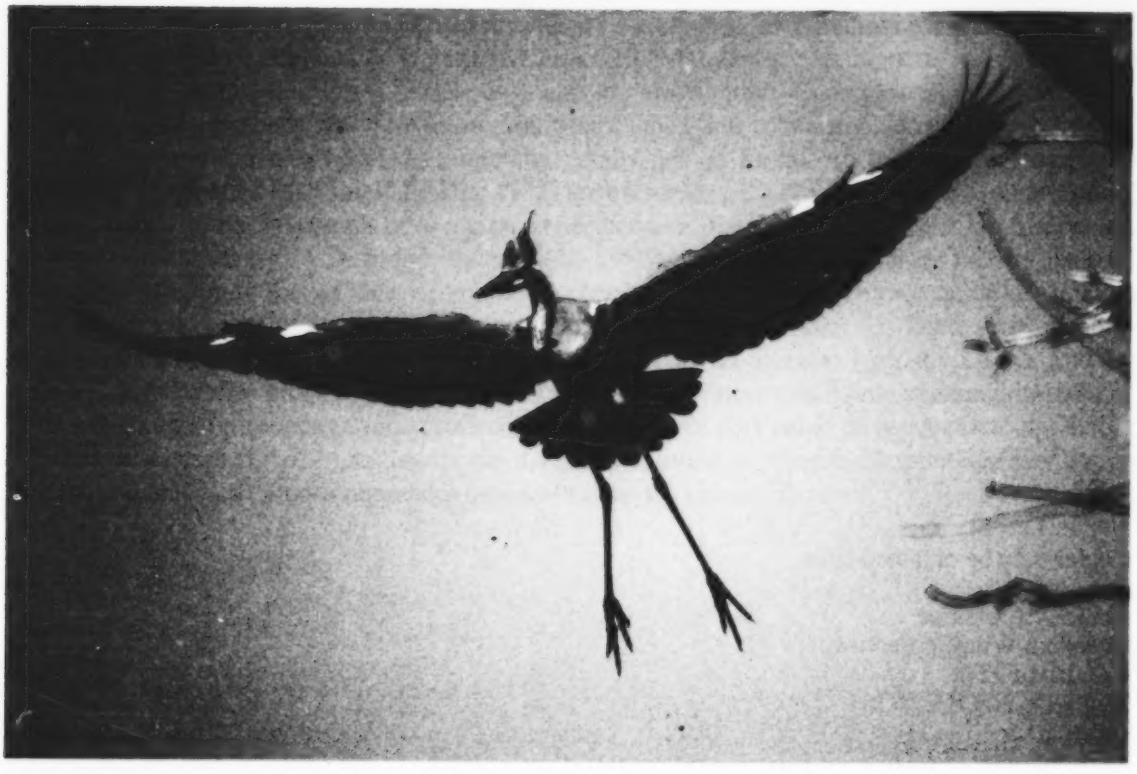

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ABSTRACT

The status of Great Blue Herons (*Ardea herodias*) breeding in the Maritime Provinces was studied as part of the National Heron Census (NHC) in 1979-82, when regional reports were published for all other parts of the species' Canadian range. That information from the Maritimes, with many other data from earlier and later periods, is summarized herein, including many details that were not presented in the Maritimes breeding bird atlas (Erskine 1992). These herons breed (or bred) in at least 34 of 36 counties in the region, and data now available confirmed the preliminary estimate (A.D. Smith, unpubl. rep. 1980) of at least 5,000 pairs breeding in the Maritimes. Breeding numbers may have increased up to 1980, but probably were stable since then. Most colonies are established in spruce-fir stands, which reflects predominance of those trees in regional forest cover. Most large colonies are located near coasts, presumably in response to better feeding opportunities in shallow coastal waters. Poorly standardized assessment of productivity produced a range of estimates (1.6-2.7 large young per nest), of which the upper limit was somewhat lower than found by two intensive regional studies in the 1970s.

RÉSUMÉ

Le statut du Grand Héron (*Ardea heroidas*) nichant dans les Provinces Maritimes fut étudié lors du Recensement National de Hérons (RNH) en 1979-82, lorsque les rapports régionaux furent publiés pour toutes les autres zones de l'aire de distribution Canadienne de cette espèce. L'information provenant des Provinces Maritimes, ainsi que plusieurs autres données datant d'avant et après l'inventaire, et de nombreux détails qui ne furent pas inclus dans l'Atlas des Oiseaux Nicheurs des Maritimes (Erskine 1992) sont résumés ici. Les hérons nichent (ou nichaient) dans au moins 34 des 36 comtés de la région, et des données maintenant disponibles confirment une estimation préliminaire (A.D. Smith, unpubl. rep. 1980) d'au moins 5000 paires nichant dans les Provinces Maritimes. Le nombre de couples nicheurs peut avoir augmenté jusqu'en 1980, mais s'est probablement stabilisés depuis. Plusieurs colonies sont établies dans des forets sapin-épinette, ce qui reflète la prédominance des ces espèces dans le couvert forestier régional. La majorité des colonies sont établies près des côtes, probablement dû aux bonnes conditions alimentaires dans les eaux côtières peu profondes. Une standardisation inadéquate de l'étude de productivité donne une étendue de valeurs (1.6-2.7 gros jeunes par nid) dont la limite supérieure est inférieure aux limites calculées suite à deux études régionales intensives dans les années 70.

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1. INTRODUCTION

The status of Great Blue Herons (*Ardea herodias*) breeding in the Maritime Provinces (New Brunswick [NB], Nova Scotia [NS], Prince Edward Island [PE]) was most recently summarized in the *Atlas of Breeding Birds of the Maritime Provinces* (hereafter 'the Atlas'; Erskine 1992). Distributional data summarized therein were obtained in 1986-90, using standard 'atlas procedures', many records not defining locations closer than 10x10km UTM square, nor numbers of breeding herons. Breeding population estimates included in the Atlas were derived by combining Atlas distributional data with the unpublished census information assembled earlier by Canadian Wildlife Service (CWS) and summarized in this report.

As outlined 25 years ago (DesGranges et al. 1979; DesGranges and Laporte 1980), surveys of Great Blue Heron breeding colonies are useful for examining both species status and health of aquatic systems. This species was selected then as:

- a water bird breeding across Canada, near both salt and fresh waters;
- a large and (often) common species, familiar to the public;
- nesting (often) conspicuously in treetop colonies, many of which may be visited without major disturbance;
- occupying a high position in aquatic food webs, thus suitable for indicating quality of ecosystems.

The National Heron Census (NHC) arising from those and related initiatives produced publications reporting status of Great Blue Herons (herons hereafter) in most parts of their Canadian breeding range. In the Maritime Provinces, data collection was also undertaken by CWS in 1979-82, but with relatively low priority, as the species and most ecosystems it occupied here were not perceived as under immediate or serious threats. After initial impetus declined, continuing low priority postponed summary of data and preparation of a report until now.

Most other Canadian regional reports [e.g. (for B.C.) Kelsall and Simpson 1980; (Prairies) Vermeer 1969, Vermeer and Anweiler 1970, Vermeer 1970; Vermeer and Hatch 1972; (Ont.) Dunn et al. 1985; (Que.) DesGranges et al. 1979] were based on 'snapshots in time' - i.e. studies in a few successive years, around 1970 (Prairies) or around 1980 (elsewhere). This (later) summary for the Maritimes was based on data accumulated over more than 40 years, with only about 40 per cent of the surveys conducted around 1980 when NHC work was done elsewhere.

Contributions of the authors were:

ADS took part in and coordinated NHC data collection in the Maritimes 1979-82 (see below). He also coordinated the Maritimes Nest Records Scheme (MNRS; see below) 1974-88, and assembled data (published and unpublished) from various sources through 1982.

AJE initiated MNRS in 1960, and coordinated its operations through 1968 and in 1988-present. He checked all CWS Atlantic Region Waterbird Colony database (see below) heron data, adding some other known records and eliminating duplicate records, and rationalizing multiple names for a given colony. He prepared for this report initial drafts of text and tables, which were revised in consultation with the other authors.

JWC coordinates the CWS Atlantic Region Waterbird Colony Database. He also provided

essential computer know-how for completing tables and maps used in this report.

JP performed mapping and GIS functions and coordinated the production of this report.

2. SOURCES OF DATA

2.1 Maritimes Nest Records Scheme, 1960-2005

MNRS data, with files held at CWS Sackville (except in 1969-74), were collected by volunteers and professionals, including also a few reports from before 1960. Heron data from MNRS (377 cards through 2002) provided locations, counts, and timing, mostly from single visits. Some cards included productivity data collected then, but many others gave only generalized impressions of breeding performance.

2.2 National Heron Census, 1979-82

NHC work in the Maritimes began in 1979, with effort tapering off rapidly after 1982. Earlier work in and coordinated by CWS, including MNRS, colony summaries, and incidental information, was assembled and summarized (125 colony sites known through 1982), together with new surveys of most known (large) colonies. Planned surveys, involving CWS and provincial wildlife personnel and some volunteers, often included data on productivity, and sometimes on use of tree species, as well as basic information similar to that from MNRS.

2.3 Aerial surveys, 1971-2003

Most aerial surveys in the Maritimes were focused primarily on waterfowl, breeding seabirds, or large raptors, with heron colonies being noted in varying detail 'in passing'. A few surveys by CWS or provincial staff were flown specifically for herons as part of NHC. Air photographs, for later counting, also were obtained on some surveys.

2.4 Maritimes Breeding Bird Atlas, 1986-90

Atlas data on breeding herons, collected throughout the Maritimes, were usually located only to 10x10km UTM squares, and provided few details beyond presence/absence and evidence for breeding. Many known colonies were revisited, most only briefly, but a number of 'confirmed breeding' records were reported in squares from which no other reports are available.

2.5 CWS Atlantic Region Waterbird Colony Database

The (computerized) database was developed by John Chardine from models previously available in the Atlantic Region, Canada, and internationally. Data were inherited from Tony Lock (CWS-AR, retired) who had collated colony information for the region in preparation for the production of a seabird gazetteer (Lock et. al. 1994). Most heron colony data were drawn from the sources noted above (excluding the Atlas), and entered into the database as the master repository of colony data for the region. Cross-checking for duplicate records and alternative colony names was not undertaken until the current write-up.

2.6 Miscellaneous

Information also resulted from incidental visits to colonies by members of the public or other government agencies, in many years and areas, often with incomplete details.

3. RESULTS

For easier comparison with data reported from other parts of Canada, we summarized distribution and population data separately for 1978-82, the five-year period when most NHC work in Quebec, Ontario, and British Columbia - and also here - was done. Locations known only from years before or after 1978-82 were mapped and tabulated separately. Data on productivity and on tree usage came mainly from 1978-82. Persistence of colonies was tracked, wherever possible, using all pertinent data available.

3.1 Heron distribution and census in different periods and regions

Table 1 summarizes colony size and population indices for different periods (1913-77; 1978-82; 1983-2005) and regions. Figures 1, 2 and 3 represent colony size and distribution during these three periods. Figure 4 represents the most recent colony size data for all known colonies in the Maritime Provinces.

Table 1. Summary of Great Blue Heron colonies visited in the Maritime Provinces, by period.

Region*	Colonies	Pairs	Colonies	Pairs	Colonies	Pairs
	1913 - 1977		1978-1982		1983-2005	
S-NB	10	154	11	297	9	301
N-NB	10	376	15	860	17	1050
NB	20	530	26	1157	26	1351
Mean pr/col	26.5		44.5		51.9	
SW-NS	26	393	17	775	22	580
Centr-NS	13	181	21	235	11	166
NE-NS	14	384	17	831	12	710
NS	53	958	55	1841	45	1456
Mean pr/col	18.1		33.5		32.4	
PE	14	1226	12	1693	9	1477
Mean pr/col	87.6		141.1		164.1	
Totals	87	2714	93	4691	80	4284

* S-NB: S of 46°N; N-NB: N of 46°N; SW-NS: S of 45°N, W of 63.5°W; Centr-NS: N&E of SW-NS, S of 45.5°N; NE-NS: N&E of Centr-NS; PE: all

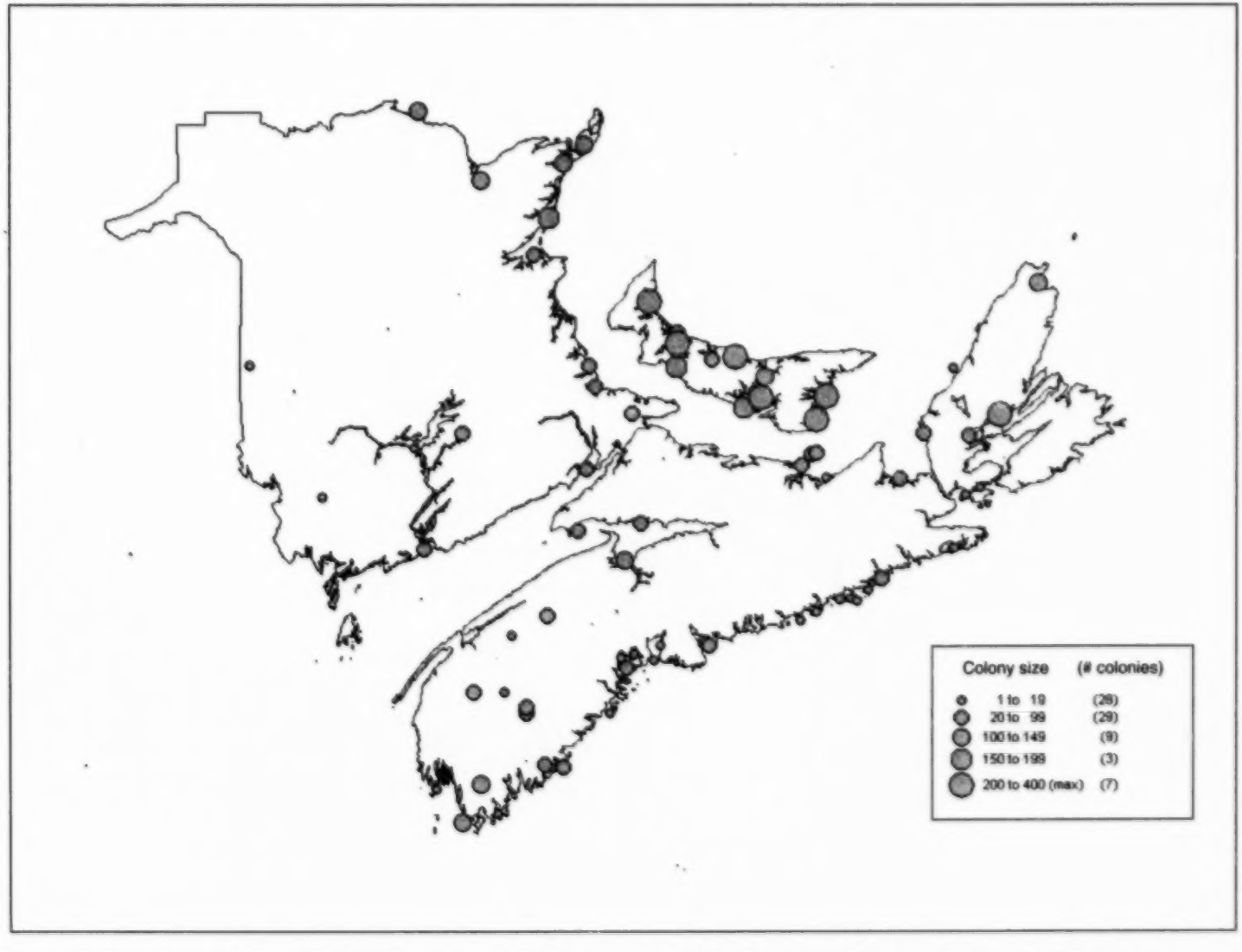

Figure 1. Location and size of Great Blue Heron colonies censused in the Maritime Provinces between 1913 and 1977 (period 1). Colony size is indicated by the number of individuals per colony.

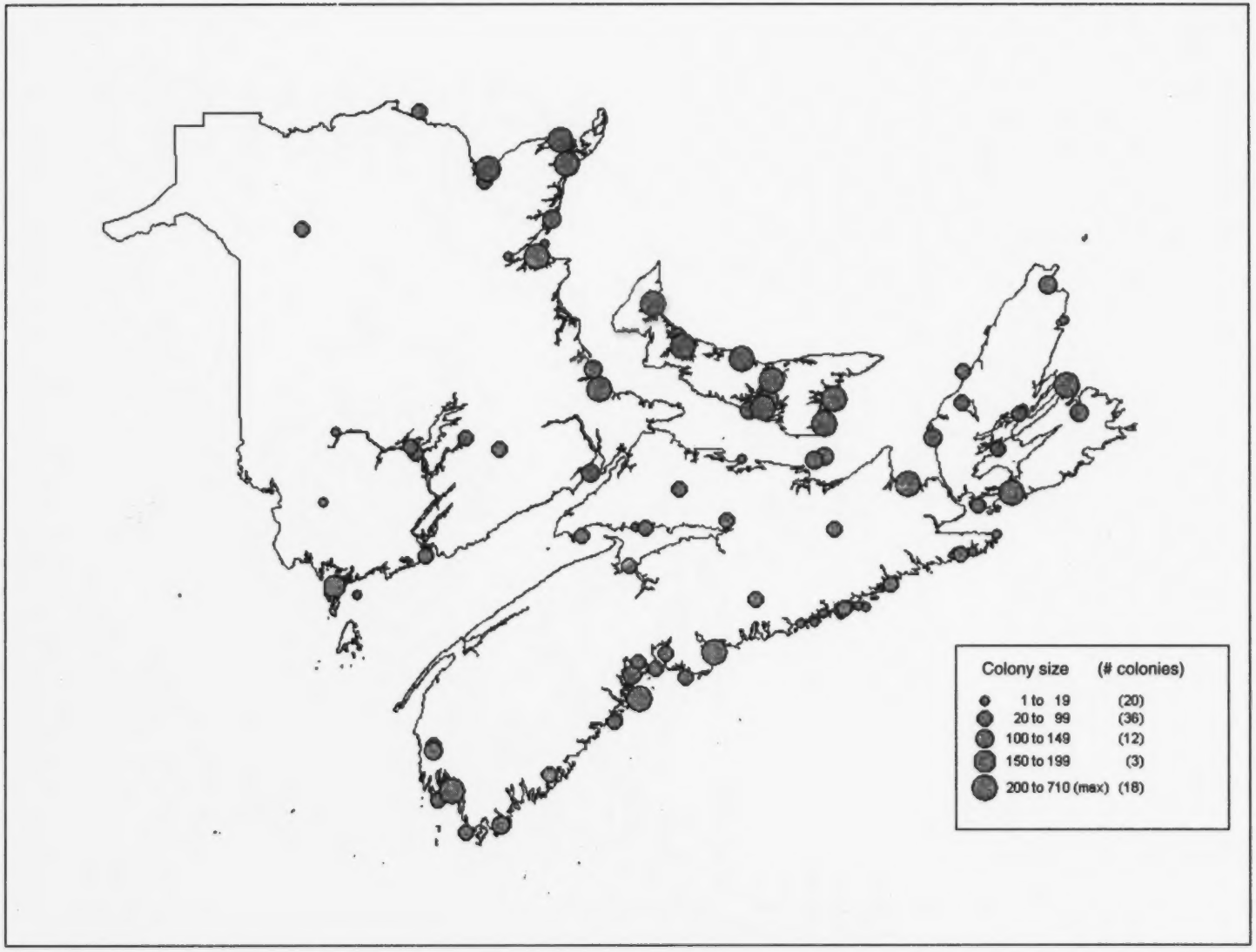

Figure 2. Location and size of Great Blue Heron colonies censused in the Maritime Provinces between 1978 and 1982 (period 2). Colony size is indicated by the number of individuals per colony.

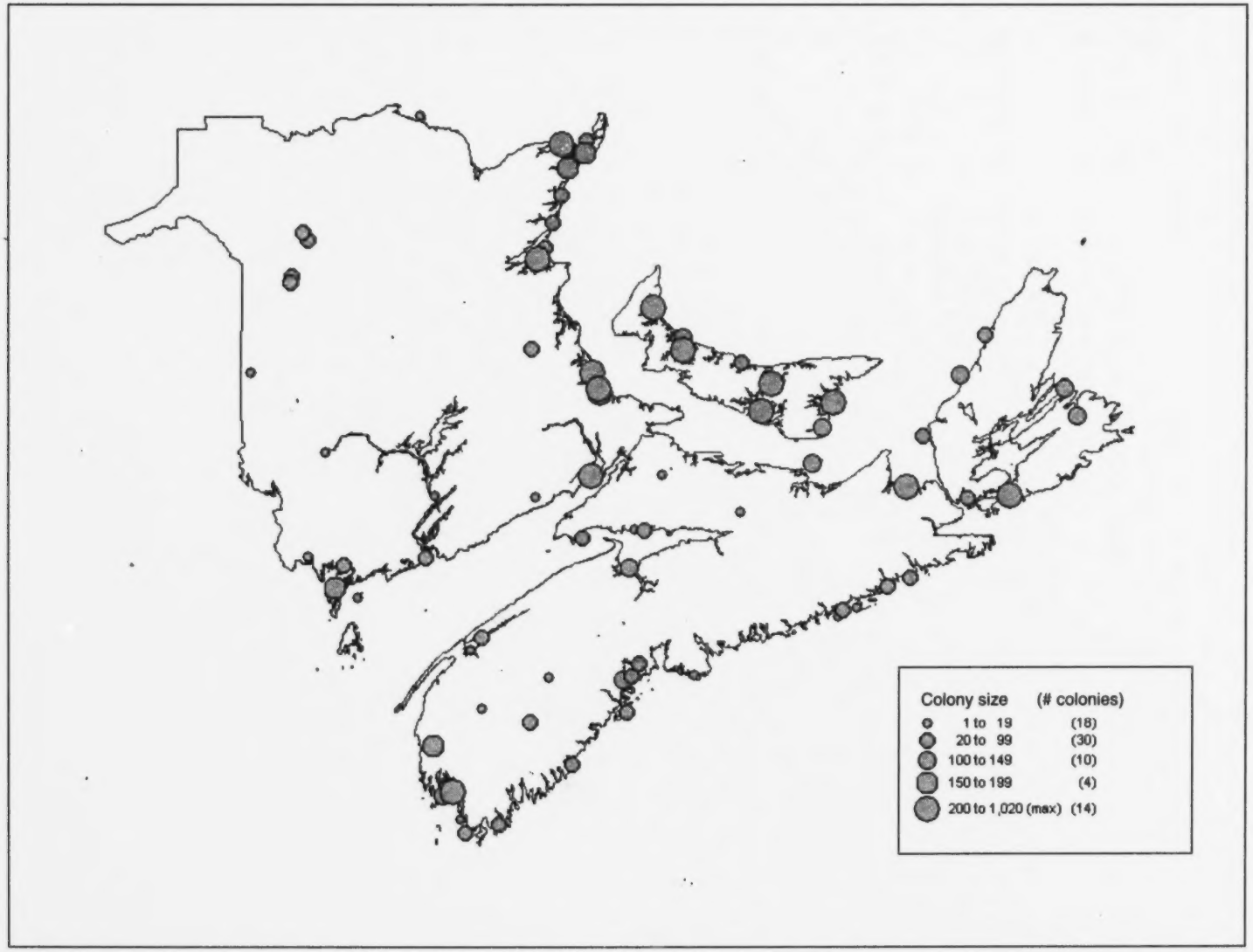

Figure 3. Location and size of Great Blue Heron colonies censused in the Maritime Provinces between 1983 and 2005 (period 3). Colony size is indicated by the number of individuals per colony.

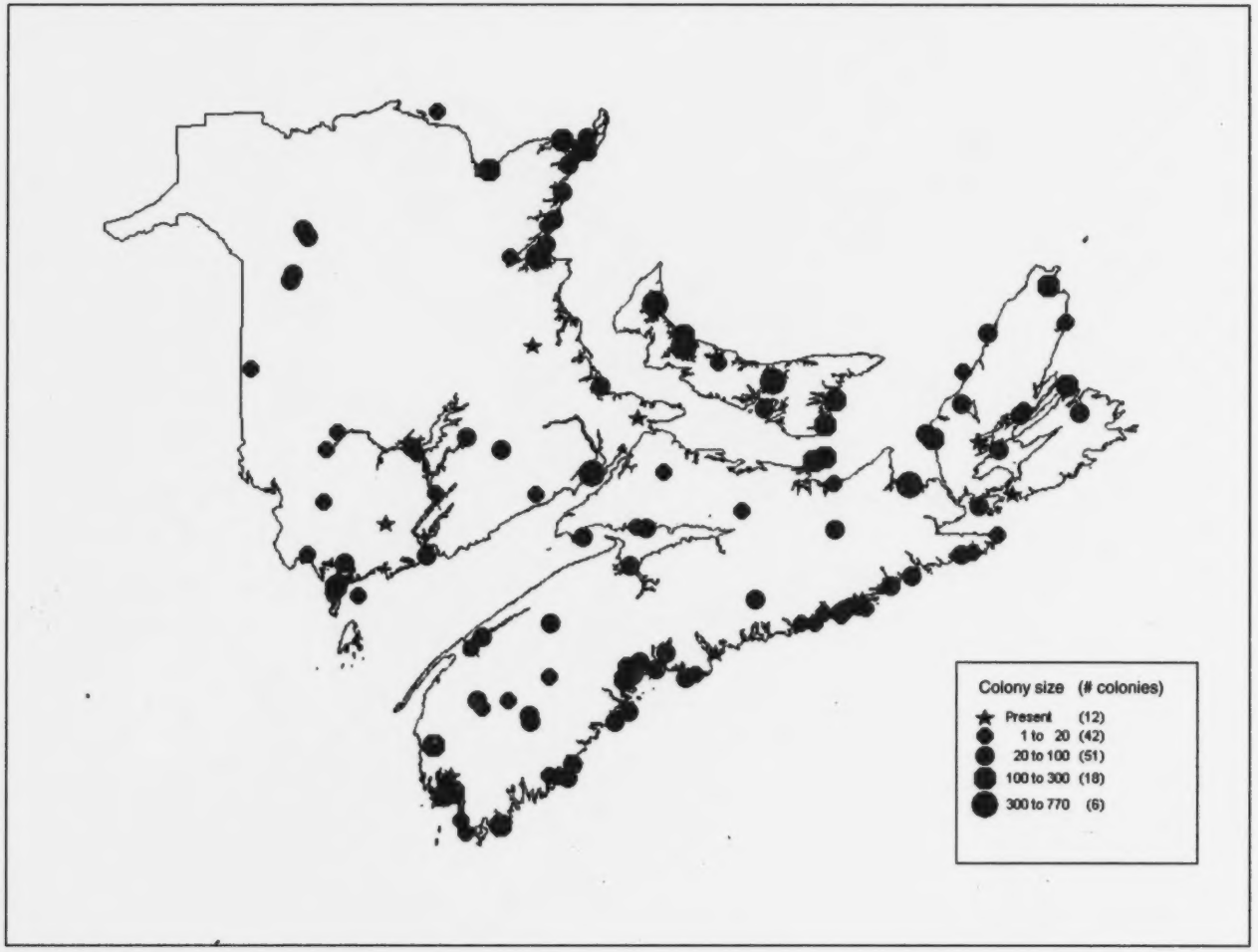

Figure 4. Location and size of Great Blue Heron colonies as most recently estimated (1913-2005). Colony size is indicated by the number of individuals per colony.

In each province, mean colony size increased from one period to the next, with much larger increases between early and NHC periods than between NHC and late periods. Diminished exploratory work after 1982 probably resulted in fewer small colonies being reported in the late period, which may explain the apparent continuing increase in colony size. Mean colony size differed between provinces in similar ratios in each period (Table 2). Differences in mean colony size between regions may arise also from differing proportions of coastal vs. inland colonies, the latter averaging much smaller in size (Table 3).

Table 2. Ratios between mean colony sizes in the Maritime Provinces, by period.

Period	Nova Scotia	New Brunswick	Prince Edward Island
1913-1977	1	1.46	4.84
1978-1982	1	1.33	4.21
1983-2005	1	1.60	5.06

Table 3. Colony sizes of Great Blue Herons in Maritime Provinces, coastal vs. inland.

	Number of colonies in size range								
Region*	1913 -1977			1978-1982			1983-2005		
	<10	10 - 99	≥100	<10	10 - 99	≥100	<10	10 - 99	≥100
Coastal									
S-NB	0	2	0	1	7	0	2	2	1
N-NB	0	8	0	2	1	4	1	7	3
SW-NS	9	4	0	0	10	2	4	2	1
Centr-NS	8	6	0	11	7	1	4	6	0
NE-NS	4	6	1	3	4	2	0	6	2
PE	1	7	6	0	6	6	1	4	5
Inland									
S-NB	2	1	0	2	1	0	3	1	0
N-NB	0	1	1	0	2	1	1	5	0
SW-NS	2	7	0	0	3	0	2	2	0
Centr-NS	0	0	0	0	2	1	0	0	0
NE-NS	0	0	0	0	2	1	1	2	0

* S-NB: S of 46°N; N-NB: N of 46°N; SW-NS: S of 45°N, W of 63.5°W; Centr-NS: N&E of SW-NS, S of 45.5°N; NE-NS: N&E of Centr-NS; PE: all

3.2 Use of tree species

Herons nest in a wide variety of trees, some colonies having all nests in one tree species whereas many different tree species were used in other locations. Many observers remarked that the tallest trees in a stand were preferred, with most nests in tree-tops. Thus choice of trees reflected those that formed - or projected above - the canopy of a stand.

Our information on tree species usage came from systematic surveys (some repeated in >1 year) of a few colonies, with anecdotal comments about many other sites. The data are summarized, by province, coastal vs. inland locations, and relative use of tree species-groups (Table 4).

Table 4. Great Blue Heron colony usage of different tree species, in Maritime Provinces.

Numbers are colonies mostly using one species-group; number plus 'x' shows colonies using >1 species-group.

Area and	Major tree species-groups**							
Category*	Sp/BF	WP/RP	Pop	WB/GB	RO	YB/AB/SuM	RM	other
Inland								
NB	4	4	1					3
NS	7,1x	6,1x		1,1x		5,1x	3x	1
Coastal								
NB	11,2x	2,1x	5x	1,2x	4x	4x	1x	1,2x
NS	32	1x	1x	5,1x	1x	1,2x		1x
PE	13		3x	5x	1x		3x	

*Province - coastal (to 1.5 km from shore) vs. farther inland;

**Sp/BF = white, black, red spruces, balsam fir;WP/RP = white or red pines; Pop = poplars (mostly trembling aspen); WB/GB = white or gray birches; RO = red oak; YB/AB/SuM = yellow birch, American beech, sugar maple; RM = red maple; other = eastern hemlock; tamarack; silver maple; American elm; cherry (sp.?); dead/unknown; on ground.

3.3 Persistence of colonies

Heron colonies change location from time to time, as shown by our records - colonies found where none was present a year or a decade earlier; others abandoned from one year to the next, some after a site had been used for 40+ years. Our data did not span the use of any site from establishment to desertion, but a composite picture emerged from the partial information available. The description following applied mainly to medium-sized to large colonies using mostly spruce and/or fir trees, the most frequent nesting substrate in coastal heron colonies (see summary above).

Data for the few and often small colonies situated in broad-leafed or white pine trees inland were too sparse for generalization.

Available data plus anecdotal reports suggested 40-50 years as a rough estimate of persistence of a heron colony on a particular site. As examples, the Judsons Island (PE) site was listed as active by Hurst (1947, cited by Godfrey 1952), reportedly used for 45+ years by 1974 (per G. Hogan, MNRS), and was abandoned in 1981; the Rustico Island site was in use when PE National Park was established in 1936, and was abandoned in 1984. The Boot Island (NS) colony was thought newly established in 1964 (per C. Coldwell, MNRS), and was still active in 2002.

A common pattern of usage started with one or a few pairs nesting, with gradual increase over 5-10 years to 20-30 pairs. Many colonies grew no farther, remaining about that size for decades, perhaps limited by nesting substrate, by foraging opportunities nearby, or by disturbance. Others, presumably with wider availability of nesting and feeding opportunities, continued to grow, sometimes by immigration from abandoned colonies nearby. For example, the Governors Island (PE) colony was formed between 1972 and 1974, and grew slowly until herons from the Judsons Island site moved there about 1981. Large colonies, in which many trees supported several heron nests, tended to kill off support trees quickly, so the age of a colony might be guessed from the proportions of nests in dead or dying vs. live trees, and by the relative area in which most trees had already fallen. As long as more nest-trees, suitably sheltered from wind and disturbance, were available nearby, a colony might continue to move through a large site. The Big Farm (NS) colony was reputed to have occupied the 'same' site from before 1922 (A.G. Bell, per K. Bentley, pers. comm. to AJE) through 1962; when found abandoned in 1963, the most recent nests were at one end of an open 'corridor' littered with fallen trees. Eventually suitable nest-trees became scarce, and a colony dwindled, disappearing quickly once numbers fell below about 20 nesting pairs. Even large colonies disappeared over time; Hurst (1947, in Godfrey 1952) listed a colony of 200-300 pairs near 'Fortune Head' (PE; presumably near Fortune Bay), an area where no colony was known in the last 40 years; the Judson Island and Rustico Island colonies each had 150+ pairs at their peaks, but were abandoned later.

Persistence of small colonies may be affected by disturbance or by survival of nesting birds as much as by availability of nest-trees. The fact that many colonies never grew larger than 5-10 pairs probably indicated that foraging opportunities nearby were limited, so any setback might set off desertion of those less desirable locations. But even isolated nests sometimes continued in use, perhaps over the life-span of a persistent heron pair; a lone nest inland up Point Wolfe River (NB) was used for at least 8 successive years (per M. Burzynski, MNRS).

3.4 Productivity of heron colonies

Assessing representative productivity of dispersed treetop nests is a challenge even under ideal circumstances. The figures obtained here (Table 5, Figure 5) suggested inadequate standardization of surveys, plus variation to be expected from inland vs. coastal colonies, and among small vs. large colonies. Including 'outliers' among data reported made recognition of patterns difficult or impossible, but discarding of most outliers - as was done - involved some subjectivity (or circular reasoning).

Table 5. Mean 'productivity' of Great Blue Herons, Maritimes, based on counts of large young in nests, mainly in 1979-82. Estimates in square brackets were graphed as outliers (see Figure 5).

Area and Category*	Mean productivity on surveys dated (sample size in parenthesis) ≤ 20 June	21–30 June	1-10 July	≥11 July
Inland				
NB	-	2.33 (1)	2.57 - 2.68 (2) [3.44]	2.25 - 2.82 (2)
NS	1.66 - 2.60 (3)	2.20 - 2.68 (3)	1.88 - 2.27 (10) [1.38, 1.56]	-
Coastal				
NB	[3.50]	1.71 - 2.62 (8)	1.64 – 2.68 (11)	[3.00]
NS	2.33 – 2.67 (3)	1.98 (1)	1.85 – 2.70 (10)	2.43 – 2.83 (4)
PE	1.64 – 2.20 (3) [3.15, 4.0]	1.66 – 2.67 (6)	1.63 – 2.54 (3) [1.29, 3.11]	1.88 (1)

*Coastal (to 1.5 km from shore) vs. farther inland.

4. DISCUSSION

4.1 Distribution

Data accumulated over 40+ years showed Great Blue Herons breeding in 34 of 36 counties in the Maritimes, scarcity of resident observers and of field work there a likely explanation for the counties with none reported. Colonies, and especially large colonies, were more often near coasts than inland, as shown earlier in the Atlas (Erskine 1992), and still earlier in Nova Scotia (Lock 1972). That generalization is biased, as herons and their colonies are more easily detected in coastal areas; the absence of large colonies (>50 pr) found inland makes it most unlikely that this bias gives a false impression of the predominance of coastal breeding by these herons.

However, small inland colonies are detected mainly by chance, and thus are certainly under-represented in our data. In southern Ontario, inland areas were sampled systematically for heron colonies by aerial surveys in late fall, when many trees were leafless (Dunn et al. 1985). The predominance of spruce and fir forests in the Maritimes reduced effectiveness of aerial surveys for detecting colonies, especially small ones, even along shorelines, at any season. Rapid exploitation of conifer forest cover here, especially inland, has left few remaining stands of tall trees favored by nesting herons, near water or elsewhere.

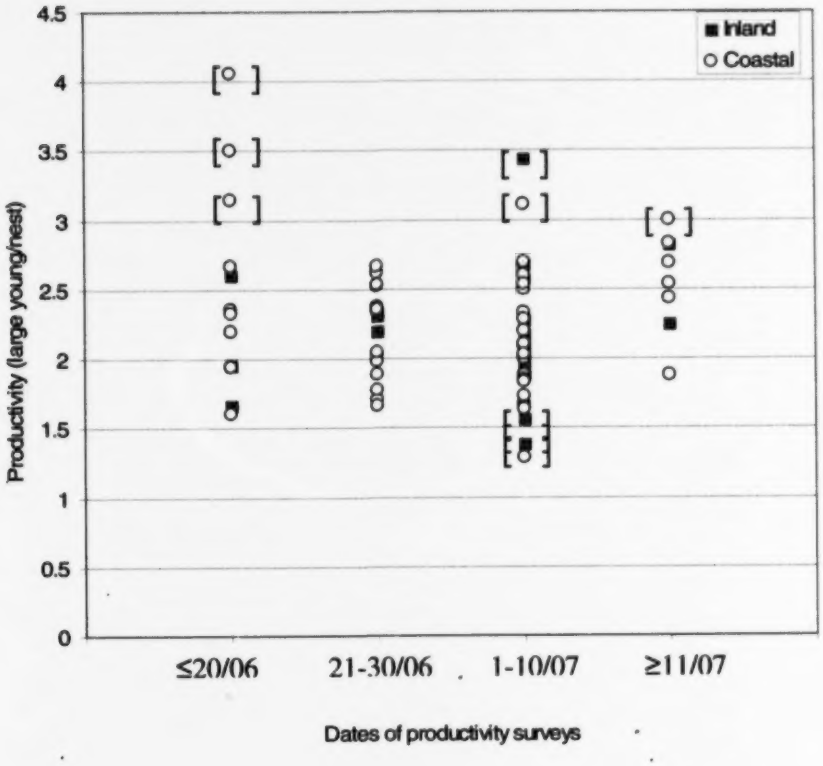

Figure 5. Productivity of inland and coastal Great Blue Heron colonies according to survey date. Thesis data were omitted from this graph.

4.2 Breeding population and trends

NHC work in the Maritimes was focused on documenting breeding distribution and numbers, with little systematic effort to monitor changes over time. The accumulated data summarized herein were poorly standardized, but provided some interesting comparisons (see Table 1). Of the 162 colonies documented to date, only 35 had nest counts/estimates in all three periods (before, during, and after NHC work here). Total nests estimated in the three periods for these 35 colonies were 1832, 3072, and 2868.

The change between early and NHC periods probably resulted partly from increasing survey intensity (Figure 6). The early period - with most larger numbers rounded-off - probably included larger proportions of cursory surveys, and thus of estimates and guesses rather than actual counts. Nest counts were encouraged in the 2nd (NHC) period, and continued in the larger colonies surveyed later. More careful and systematic surveys also should have reduced the proportions of old (inactive) nests included in counts.

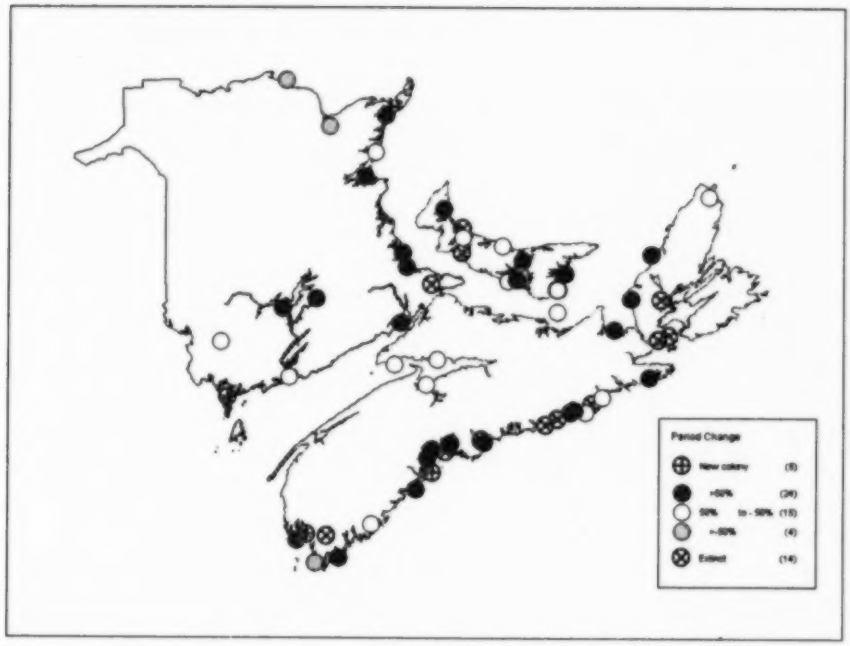

Figure 6. Changes in colony location and size between periods 1 and 2 (1913 to 1977, and 1978 to 1977).

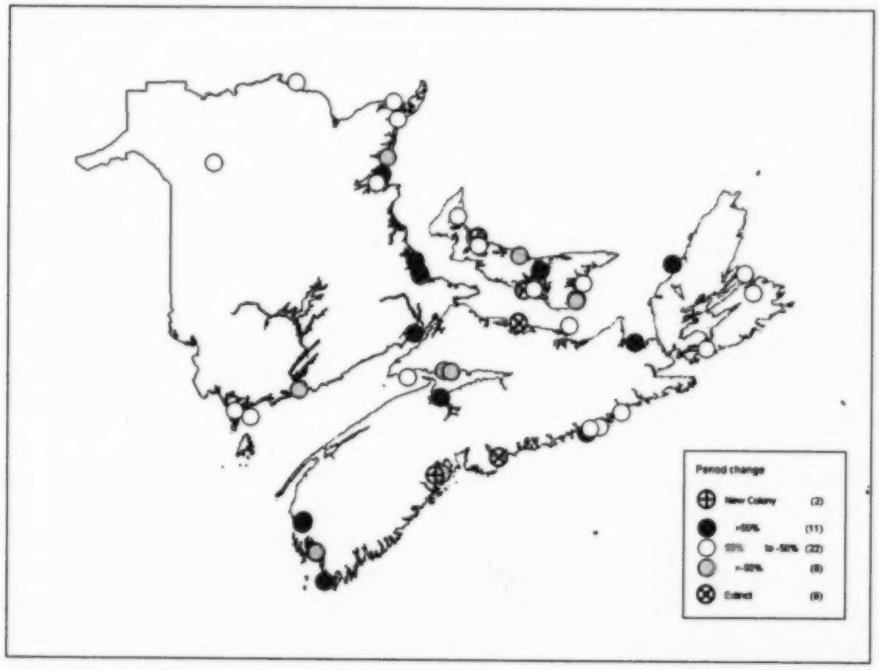

Figure 7. Changes in colony location and size between periods 2 and 3 (1978 to 1982, and 1983 to 2005).

We concluded that no population change was indicated between the NHC and the last period (Figure 7). Part of the increase after the early period might be real, reflecting increased conservation interest. Both unintentional disturbance, and deliberate persecution (of herons as predators of fish), may have decreased after the 'environmental movement' began to take effect, starting in 1960s.

4.3 Use of nest trees and habitat

The predominant use of spruces and/or fir nearly everywhere presumably reflected the dominance of forest cover by those species in this region, especially near coasts. Use of pines was apparently mostly in relict stands, on islands or remote ridges inland. Birches (except yellow birch) and poplars, common successional species in conifer areas, were used mainly near the Gulf of St. Lawrence, as were the 'northern hardwoods' (beech, yellow birch, maples). Summers average warmer there than on the Atlantic or Bay of Fundy coasts; thus differences in use of tree species and habitats likely reflected ecological zonation. Probably the birds used whatever tree species were most available in a region (as remarked earlier by McAloney 1973), given access to adequate foraging areas and freedom from disturbance and predation. Relative durability of different tree species, including resistance to heron droppings as well as to zonal climatic factors, probably influenced the persistence of heron colonies in any area.

4.4 Productivity of heron colonies

The productivity data, assembled during and after the NHC period, were gathered largely by technical and seasonal employees of CWS and provincial wildlife agencies. The same instructions were issued to all observers, but their application often varied, for logistical and individual reasons.

Many factors affected the representativeness of those counts. Surveys estimated numbers of young in varying proportions of the nests counted as active or as containing young. Numbers of young noted often were considered minimal.

Although most surveys with productivity data were conducted (as recommended) in late June and early July, some were done up to 20 days earlier (12%) or later (10%) than the preferred period. Early surveys may be biased upward by counting young before all pre-fledging losses had occurred, but may miss late-hatched young that seldom stand erect. Late surveys miss young that fledged early, but are less likely to miss young too small to be easily detected. The amount of time spent watching each nest to determine numbers of (live) young present likely varied widely between observers, and may vary between years with the same observer for logistic reasons.

Difficulty in moving through colonies with many fallen trees or dense undergrowth sometimes restricted samples counted, and affected comparability with other colonies. Effectiveness in detecting nests and determining their contents varied depending on density and foliage patterns of the tree canopy.

Too few colonies were assessed to compare productivity in successive years. Comparisons might be meaningful in 1980-81, with 7 colonies counted in both years. Estimated productivity in 1981 was lower at 5 of 7 colonies; at another colony the 1981 count (on 18 June) was 16 days

earlier than in 1980. At the only two colonies (30 km apart, on Cape Breton I) assessed in several years, the estimates were:

- Prince Mine rd: 1982-2.17; 1984-1.66 (early); 1986-1.77 (late); 1987-2.14 & 2.27; 1988-2.68;
- Prime Brook: 1979-1.93; 1981-2.12; 1982-1.56; 1984-1.95 (early); 1988-2.31.

When both those colonies were assessed in one year, the estimates showed no obvious pattern (neither consistently higher than the other). Inter-annual variation in productivity could not be assessed meaningfully from the few samples available in the Maritimes.

A plot (Figure 5) of productivity against survey date suggested similar a range in productivity in the three periods through the nesting season, but the last period gave higher figures. With the few extreme 'outliers' excluded, nearly all colonies sampled showed between 1.6 and 2.7 large young per nest, whereas samples counted after 10 July gave 2.2-2.8 yg/nest. More intensive studies in the Maritimes (McAloney 1973; Quinney 1979, 1982) found productivity levels (2.6-3.2 yg/nest) somewhat above those reported here.

5. ACKNOWLEDGEMENTS

This report summarizes the efforts of many volunteers and professional staff over many years, and we thank them all. A few deserve special thanks for individual contributions and for organizing surveys by others: A. Lock (Dalhousie U., later CWS), R. Stocek (Maritime Forest Ranger School), P. Austin-Smith and R. Milton (N.S. Dept. Nat. Res. Wildl. Dvn, Kentville), D. Harris and G. Ball (N.S. Dept. Nat. Res. Wildl. Dvn., Sydney), and R. Curley (P.E.I. Dept. Environment Wildl. Br.) contributed important and wide-ranging surveys in many years. Many other people helpfully answered queries regarding colonies reported earlier.

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Appendix 1. Great Blue Herron colonies known in the Maritime provinces, 1913-2005

Name	County	Lat	Lon	Visits (n)	year 1st visit	Year last visit	Pairs (latest)	Pairs (max.)	Year max.
New Brunswick									
Aldouane Peninsula	Kent	43.72	64.88	2	1974	1980	0	0	1980
Baie du Vin Island	Northumberland	47.09	65.11	8	1974	2005	181	229	1993
Bartibog	Northumberland	47.09	65.36	1	1979	1979	1	1	1979
Bass River	Gloucester	47.57	65.58	6	1965	1981	0	50	1970
Bass River, Kent Co. (NB)	Kent	46.53	65.15	2	1985	1986		40	1985
Bonny River	Charlotte	45.16	66.85	1	1987	1987	10	10	1987
Caraquet Island	Gloucester	47.82	64.89	6	1979	2005	107	107	2005
Cocagne Island	Kent	46.38	64.59	8	1974	2005	0	123	1998
Colburg Rd & Gaspereau R	Westmorland	46.05	64.08	2	1977	1979		32	1977
Comeau Settlement	Northumberland	47.28	65.02	2	1980	1981	2	2	1981
Grand Lake Meadows	Queens	45.85	66.20	3	1963	1981	6	10	1980
Grindstone Island	Albert	45.72	64.61	10	1974	1999	167	182	1992
Hardwood Island (FH)	Charlotte	45.02	66.93	6	1974	1988	82	82	1988
Heron Island	Restigouche	48.00	66.16	6	1966	2005	2	50	1970
Hutchinson Brook	Victoria	47.22	67.18	1	1990	1990	18	18	1990
Ile Lamèque	Gloucester	47.84	64.66	1	1993	1993	43	43	1993
Inkerman	Gloucester	47.67	64.83	10	1971	2005	19	115	1981
Jones Brook area, Lower Beulah, Kars Parish (NB)	Kings	45.60	66.03	2	1991	1992	7	7	1992
Lameque	Gloucester	47.79	64.64	3	1968	2005	0	60	1968
Little Burntland Brook	Victoria	46.98	67.33	2	1983	1984	18	18	1983
Little Mactaquac Stream, 2.5 km SE of Scotch Settlement	York	45.98	66.92	1	1980	1980	1	1	1980
Manawagonish Island	Saint John	45.21	66.11	7	1963	1986	10	44	1979
Marsh S Baie de Lameque	Gloucester	47.77	64.67	1	2000	2000	81	81	2000
McAllister Cove, Spednic Lake	York	45.63	67.67	2	1964	1980	0	0	1980
Mohawk Island	Charlotte	45.04	66.90	2	1979	1980	12	21	1979
Noonan Stream	Sunbury	45.88	65.44	1	1980	1980	20	20	1980
Oromocto Lake, uni in	York	45.54	67.04	2	1974	1980	6	8	1974
Partridge Island 2 (NB)	Charlotte	45.02	66.93	1	1974	1974			1974
Phillipstown	Queens	45.95	65.75	3	1974	1980	44	44	1980
Pointe-à-Bouleau	Gloucester	47.50	64.88	1	1991	1991	20	20	1991
Portage Island	Northumberland	47.17	65.03	2	1980	1991	21	21	1991
Queens Ridge	Charlotte	45.42	66.48	1	1974	1974			1974
Salmon Beach, south of	Gloucester	47.64	65.54	1	1979	1979	100	100	1979
Shediac Island North	Westmorland	46.28	64.54	4	1979	2005	33	192	1998
Shediac Island South	Westmorland	46.25	64.54	6	1974	1998	0	105	1984
Sisson Brook	Victoria	47.26	67.22	5	1979	1985	25	25	1984
Spoon Island	Charlotte	45.22	67.18	1	1987	1987	3	3	1987
Spruce Island (WA)	Charlotte	44.96	66.73	2	1979	1988	3	3	1979
Tabusintac River, 2 km s. of mouth	Northumberland	47.32	64.97	5	1974	1991	15	75	1974
Tower Hill	Victoria	46.94	67.34	2	1983	1984	20	20	1984
Upper Timber Lake	Sunbury	45.89	66.24	1	1980	1980	10	10	1980

W bank E branch Pt. Wolfe R. nr confluence with main river	Saint John	45.59	65.12	2	1984	1986	1	1	1984
Waterloo Lake	York	45.88	67.02	1	1986	1986	3	3	1986
Williamstown	Carleton	46.38	67.70	2	1974	1996	1	3	1974
Nova Scotia									
Alder Point	Cape Breton	46.29	60.31	1	2000	2000	12	12	2000
Baddeck Bay	Victoria	46.13	60.71	1	1981	1981	8	8	1981
Baddeck Inlet	Victoria	46.07	60.83	4	1974	1977	0	105	1974
Barren Island (NTB)	Guysborough	44.95	62.04	3	1971	1980	0	9	1971
Battery Lakes	Pictou	45.37	62.42	1	1980	1980	10	10	1980
Bear Island (BOF)	Digby	44.63	65.70	1	1987	1987	3	3	1987
Belmont Mountain	Colchester	45.42	63.39	2	1978	1981	0	12	1978
Betty Island	Halifax	44.44	63.76	1	1980	1980	15	15	1980
Bickerton Island	Guysborough	45.08	61.72	1	2002	2002	17	17	2002
Big Farm	Victoria	46.10	60.82	4	1922	1963	0	0	1963
Big Fish Island, Tusket River	Yarmouth	43.70	65.95	1	1994	1994	70	70	1994
Big Pine Lake	Digby	44.30	65.65	1	1975	1975	12	12	1975
Big Rorys Point	Inverness	45.95	61.53	2	1963	1982	54	54	1982
Birch Island	Richmond	45.60	61.01	2	1971	1980	0	8	1971
Birch Point, uni off, e. side of Big Harbour Island	Inverness	45.87	60.94	4	1978	1981	29	42	1980
Black Duck Island	Guysborough	45.22	61.25	1	1971	1971	8	8	1971
Bon Portage Island	Shelburne	43.47	65.75	6	1977	1997	4	50	1977
Bonds Island	Yarmouth	43.73	65.87	5	1975	1983	55	140	1981
Boot Island	Kings	45.14	64.26	25	1964	2002	42	61	1986
Brant Thrum	Shelburne	43.52	65,45	1	1987	1987	18	18	1987
Brokenback Island	Halifax	44.89	62.27	3	1977	1982	2	3	1981
Bruce Lake	Halifax	44.93	63.13	1	1982	1982	15	15	1982
Campbell's Island	Richmond	45.55	61.15	4	1971	1992	0	6	1971
Channel Island	Yarmouth	43.72	65.86	8	1975	1998	60	100	1993
Charles Island	Halifax	44.93	62.17	1	1975	1975			1975
Chase Lake	Cumberland	45.73	63.96	1	1986	1986	6	6	1986
Cheticamp Island	Inverness	46.61	61.04	1	2001	2001	35	35	2001
Cross Island	Lunenburg	44.31	64.18	3	1975	1980	0	100	1978
Crow Island (DB)	Guysborough	45.34	60.94	1	1980	1980	9	9	1980
Dargie Lake	Annapolis	44.66	65.30	2	1974	1975	0	8	1974
Delorier Island	Richmond	45.52	61.12	2	1980	1982	13	13	1982
Doctors Island (GSt.L)	Pictou	45.75	62.65	3	1955	1966	0	30	1960
Franks George Island	Halifax	44.60	63.94	2	1975	1980	19	19	1980
Freeman Island	Richmond	45.58	61.20	2	1985	1997	0	35	1985
Foggy Islands 1	Lunenburg	44.23	64.28	1	2004	2004	20	20	2004
Foggy Islands 2	Lunenburg	44.23	64.28	1	2004	2004	20	20	2004
Goat Island	Annapolis	44.70	65.61	1	1987	1987	30	30	1987
Gravel Island	Lunenburg	44.50	64.03	1	1980	1980	10	10	1980
Gravel Island, Halifax County	Halifax	44.78	62.72	1	1980	1980	2	2	1980
Green Island 2	Yarmouth	43.68	66.00	3	1975	1981		30	1979
Guilford Island	Halifax	44.81	62.51	2	1971	1978	0	3	1971
Haley Lake	Shelburne	43.83	65.00	3	1944	1981	6	20	1944

Halibut Island, Big	Halifax	44.89	62.20	3	1978	2002	12	12	2002
Harbour Island	Guysborough	45.23	61.17	1	1980	1980	3	3	1980
Henry Island	Inverness	45.98	61.60	1	2004	2004	35	35	2004
Horse Island	Halifax	44.84	62.36	2	1980	1987	4	4	1987
Horse Island [W]	Halifax	44.85	62.52	1	1980	1980	1	1	1980
Indian Island [SW]	Lunenburg	44.16	64.40	2	1971	1980	10	10	1980
Ingonish Island	Victoria	46.69	60.33	1	1981	1981	1	1	1981
Inside Eastern Harbour Island	Halifax	44.87	62.32	4	1975	1987	14	15	1981
Jackies Island	Queens	43.90	64.78	1	1987	1987	12	12	1987
Johns Island	Shelburne	43.55	65.79	1	1987	1987	1	1	1987
Kidston Island	Victoria	46.09	60.75	2	1979	1980	16	16	1980
Lake George, Big Island	Yarmouth	43.98	66.04	2	1981	2001	0	64	1981
Lake George, uni in N end	Yarmouth	44.02	66.04	3	1979	2001	77	77	2001
Lake Rossignol 1	Queens	44.17	65.17	2	1975	1983	36	36	1983
Lake Rossignol 2	Queens	44.21	65.17	1	1975	1975	31	31	1975
Lawlor Island	Halifax	44.60	63.49	9	1965	1987		106	1980
Little Rafuse Island	Lunenburg	44.46	64.24	3	1975	1987	15	57	1980
Long Island (BH)	Halifax	44.89	62.30	2	1971	1978	0	6	1971
Loye Island	Lunenburg	44.43	64.32	3	1978	2004	60	60	2004
MacCormicks Corner, 1.5 km north	Inverness	46.17	61.27	4	1978	1981	19	49	1980
MacDonald Pond	Inverness	45.93	61.12	3	1945	1978		17	1963
Margaree Island	Inverness	46.37	61.26	11	1973	2000	7	53	1986
McCallum Settlement	Colchester	45.49	63.26	1	1989	1989	2	2	1989
McNabs Island	Halifax	44.61	63.53	3	1965	1980	0	30	1966
Merigomish Island, Big	Pictou	45.67	62.42	1	1975	1975	1	1	1975
Middle Halibut Island	Halifax	44.90	62.20	1	1971	1971	2	2	1971
Millvale	Cumberland	45.62	63.82	3	1978	1981	0	12	1978
Mountain Island	Lunenburg	44.53	64.20	1	1987	1987	1	1	1987
Oak Island (MB)	Lunenburg	44.52	64.30	1	1975	1975	6	6	1975
Oakland Lake	Digby	44.25	65.60	1	1990	1990	1	1	1990
Outer Islands (SH)	Halifax	44.75	62.66	2	1971	1980	0	1	1971
Peskawa Lake	Digby	44.30	65.37	1	1964	1964	3	3	1964
Pictou Island	Pictou	45.82	62.56	2	1966	1971	30	30	1966
Pictou Island East Point	Pictou	45.83	62.51	3	1975	1980	53	53	1980
Pictou Island West Point	Pictou	45.81	62.60	3	1979	1987	60	65	1980
Pinnacle Island	Cumberland	45.38	64.12	7	1971	2004	10	41	1978
Pomquet Island	Antigonish	45.66	61.75	8	1971	2002	183	183	2002
Port Joli Head	Queens	43.82	64.83	2	1971	1972	20	20	1971
Port l'Hebert	Queens	43.82	64.93	2	1971	1972	5	5	1971
Port Mouton Island	Queens	43.91	64.77	1	1975	1975			1975
Powers Island	Halifax	44.46	63.67	1	1987	1987	2	2	1987
Prime Brook	Cape Breton	46.11	60.20	8	1978	1988	30	66	1984
Prince Mine Rd	Cape Breton	46.28	60.32	9	1980	1992	62	104	1982
Rain Island	Shelburne	43.52	65.43	3	1975	1981	56	56	1981
Saddle Island 2	Lunenburg	44.53	64.19	3	1965	1980	18	18	1980
Saddle Island NS 3	Cumberland	45.82	63.26	3	1980	2004	0	6	1980

Scragg Lake	Annapolis	44.78	64.98	1	1913	1913	25	25	1913
Sheep Island (AB)	Victoria	46.91	60.48	3	1945	1982	65	65	1982
Ship Island (NS)	Halifax	44.93	62.24	1	1975	1975			1975
Snake Island	Lunenburg	44.54	64.17	3	1975	2004	25	25	2004
Southwest Island (NS)	Halifax	44.50	64.00	2	1971	1980	0	6	1971
Spencers Island	Cumberland	45.33	64.69	5	1975	1987	15	24	1975
St. Peters, uni N of	Richmond	45.60	60.81	3	1980	1987		153	1980
Stony Island	Halifax	44.79	62.59	1	1980	1980	5	5	1980
Sugar Harbour Island, West	Guysborough	45.21	61.27	4	1971	1981	12	12	1981
The Brothers, inner	Cumberland	45.39	64.22	2	1980	1987	1	7	1980
The Pancake	Halifax	44.86	62.38	2	1978	1980	1	8	1978
Tobacco Island	Guysborough	45.02	61.91	7	1971	1987	13	42	1971
Tupper Lake.	Queens	44.45	65.00	7	1990	1996	3	3	1996
Wabei Lake	Shelburne	43.71	65.59	2	1975	1980	0	50	1975
White Islands (NS)	Halifax	44.88	62.13	2	1977	1978	2	4	1977
Yarmouth	Yarmouth	43.83	65.88	2	1988	1991			1988
Prince Edward Island									
Bird Island (GSt.L)	Prince	46.60	63.82	4	1982	1987	12	13	1984
Blooming Point	Queens	46.39	62.98	2	1980	1981	26	26	1981
Boughton Island	Kings	46.19	62.42	6	1973	2003	138	170	1981
Cherry Island	Kings	46.03	62.50	6	1966	2003	0	31	1981
Courtin Island	Prince	46.53	63.78	9	1973	2003	192	250	1987
Georges Island	Prince	46.60	63.78	4	1975	2003	51	51	2003
Glenfinnan Island	Prince	46.31	62.98	7	1974	2003	385	507	1997
Governors Island	Queens	46.13	63.06	6	1974	2003	39	202	1981
Granville	Queens	46.42	63.47	5	1972	1976	6	20	1975
Herring Island (PE)	Kings	46.03	62.51	8	1966	2003	61	155	1981
Holman Island	Prince	46.37	63.79	2	1974	1981	0	75	1974
Judsons Island	Queens	46.18	63.01	8	1963	1981	0	200	1973
Oultons Island	Prince	46.79	64.05	9	1973	2003	216	355	1981
Rustico Island	Queens	46.44	63.25	13	1963	1984	0	147	1963
St. Peters Island	Queens	46.12	63.18	5	1973	1981	52	90	1973
Thomas Island	Kings	46.03	62.51	3	1966	1981	0	6	1966

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GREAT BLUE HERONS BREEDING IN THE MARITIME PROVINCES

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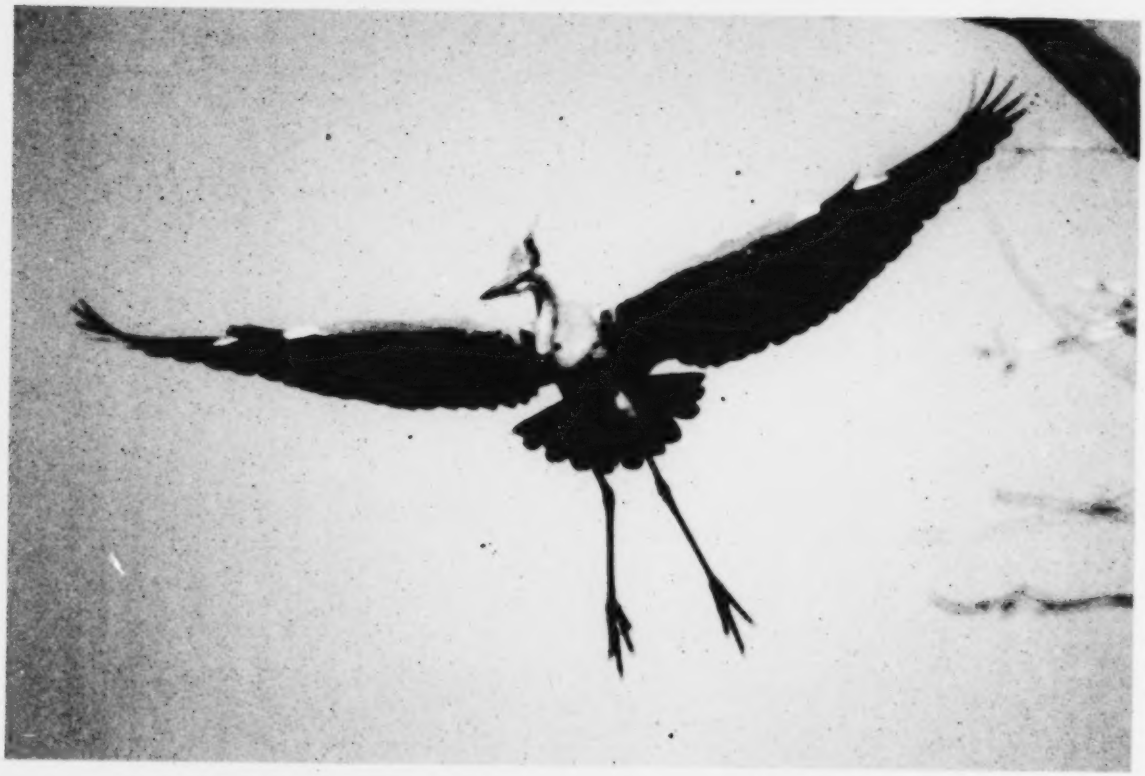

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